

Remarks

Reconsideration of this Application is respectfully requested. Applicants submit that the amendments submitted herein should be entered after final, as the amendments reduce the number of issues on Appeal and/or put the pending claims of the application in condition for allowance.

Upon entry of the foregoing amendment, claims 1-5, 7, 8, 10-31, 33, 34, 36-64 are pending in the application, with claims 1, 51, 52 and 53 being independent. Contrary to the final Office Action, claim 6 is no longer pending in the application, as it was cancelled in Applicant's Reply and Amendment dated December 29, 2003. Claims 9 and 35 are sought to be cancelled without prejudice to or disclaimer of the subject matter therein. Claims 1 and 39 are sought to be amended by this paper, while new claims 53-64 have been added. Claims 11-28, 51 and 52 have been withdrawn from consideration. Applicants submit that the amendments to claims 1 and 39, as well as the newly presented claims, introduce no new matter into the application, and their entry is respectfully requested.

Based on the above amendment and the following remarks, Applicants respectfully request that the Examiner reconsider all outstanding objections and rejections and that they be withdrawn.

Priority Under 35 U.S.C. § 119

Applicants note that the Examiner has made an acknowledgment of **all** claims for foreign priority under 35 U.S.C. § 119 and that copies of the certified copies of the

priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

Elections/Restrictions

Although not in agreement, Applicants acknowledge that the Examiner has taken the position that claims 51 and 52 are directed to an invention that is independent or distinct from the prior election made by Applicants, and that claims 51 and 52 have been withdrawn from consideration as being directed to a non-elected invention.

Rejections under 35 U.S.C. § 112

The Examiner has rejected claim 35 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter of the invention. More particularly, the Examiner has stated that the recitation that the seat of claim 35 faces "aft" is not understood. By this paper, Applicant seeks to cancel claim 35 without prejudice to, or disclaimer of, the subject matter therein. With this cancellation, Applicants submit that the rejection under Section 112 is moot and should be withdrawn.

Rejections under 35 U.S.C. § 103

The Examiner has rejected claims 1, 3-7, 9-10 and 34-38 as being anticipated by the disclosure of European Patent Publication No. EP 0 036 822 A1 to LeGrand (the "LeGrand publication") in view of U.S. Patent No. 3,074,759 to Bergenwall (the "Bergenwall patent"). Although the rejection under Section 103 encompasses both

independent and dependent claims, Applicants' remarks will focus on independent claim 1 only, since to the extent that independent claim 1 is shown to be patentable, so too are the rejected dependent claims by virtue of their dependency.

The Examiner has taken the position that (1) the LeGrand publication reveals all of the claimed elements with the exception of a back portion and seating portion moveable to a fully reclined position in which the seating portion and back portion form a flat surface and (2) the Bergenwall patent teaches the use of a seat with a back (5) and a seat (10) that are moveable to a fully reclined flat position as disclosed in Figure 8 thereof. According to the Examiner, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the seat reclining mechanism (103)(104)(105)(106)(107) disclosed by the LeGrand publication to allow for positioning of the seating unit to a fully flat position to improve the comfort of the seat occupant by providing a "couch" position. *See* page 5, paragraph 3 of the final Office Action. Applicants respectfully disagree with the Examiner's combination under Section 103 for the following reasons.

Independent claim 1 as amended herein recites an *aircraft* seating unit comprising a pair of seats facing in opposite directions with each seat comprising a seating space for receiving the seated body of an occupant and an extension space for the legs of the occupant. The seats are positioned along each side of a longitudinal axis with the seating space of one seat extending over the longitudinal axis at the extension space of the other seat. Either one of the seats has a seat axis substantially parallel to the longitudinal axis. Each seat has a back portion and a seating portion. The seating portion is movable with the back portion to allow the back portion to move between an

upright position and a *fully* reclined position in which the seating portion and the back portion form a flat surface.

First, as the Examiner knows, an obviousness rejection under Section 103 cannot be based on a combination of references, unless there is something in the teachings thereof that would provide one of ordinary skill in the art with the incentive or motivation to make the combination. In addition, it is impermissible to combine references under Section 103 where the combination destroys the primary reference or makes it inoperable or where the references teach away from each other. *See In re Gordon*, 733 F.2d 900, 221 U.S.P.Q. 1125 (Fed. Cir. 1984). Applicants submit that one of ordinary skill in the *aircraft seating* art would not be motivated to combine the teachings of the LeGrand publication directed to high-density, tiered berths *for use in a train or railway carriage* with the *crude and structurally sparse reclining chair* of the Bergenwall patent. Regulatory standards for the seats of aircrafts are both numerous and complex to ensure passenger safety. To combine the teachings of the LeGrand publication (for use in a train) with those of the Bergenwall patent (for a simple chair) would conflict with such regulations and simply confound one of ordinary skill in the art. For example, aircraft manufacturers are required to provide tracks along the aircraft cabin floor to which all seats must be attached. Aircraft seats are designed by artisans in the aircraft seating art to fit within these tracks, while simultaneously meeting other safety requirements and comfort/privacy considerations. Neither an aircraft manufacturer, nor an aircraft seat designer, would be motivated to consider the teachings of either the LeGrand publication or the Bergenwall patent, as the structure of neither meets the relevant requirements for aircraft seats and any modifications thereto would

give rise to undesirable cost and regulatory compliance issues. Pages from the Internet directed to the standards and regulations associated with aircraft seating, in support of Applicants' arguments, are attached hereto for the Examiner's consideration, as Exhibit A.

Moreover, there is nothing in the disclosure of either reference that would motivate one of ordinary skill in the art to combine the structure of the LeGrand publication with that of the Bergenwall patent. The LeGrand publication is concerned with providing a multiplicity of elongate seats having a reclined or couched profile in a compartment of a railway carriage. The LeGrand publication is particularly concerned with providing the maximum number of seats in a compartment and achieves this by arranging the couches in tiers or levels. The LeGrand publication puts particular emphasis on the construction of the couches being such as to reduce the thickness from 5 cm to 3 cm, the cumulative effect of which is to allow the creation of a fifth level. See page 4, lines 15 to 32 of the translation provided by Applicants and attached hereto for the Examiner's ease of reference, as Exhibit B. It is thus a critical part of the teaching of the LeGrand publication that the vertical space occupied by each couch is minimized. A savings of just 20 cm provides this advantage. Applicants submit that this advantage would be entirely lost if the couches of the LeGrand publication were made movable to an upright position, by combination with the teachings of the Bergenwall patent as suggested by the Examiner. Such movement would entirely negate the 2 cm per couch savings and would likely result in the removal of a least one tier or level, so that there would be no more than three tiers or levels. Thus, having a couch capable of moving to

an upright position would be entirely contrary to the teachings of the LeGrand publication.

As shown in Figures 3, 11 and 12 of the LeGrand publication, the couches are supported at their ends in the manner of a hammock. Applicants submit that this structure simply cannot provide the upright position recited in claim 1. Furthermore, it is not clear how the couch arrangement could be modified to provide an upright position, leaving aside that this would be completely contrary to the disclosure of the LeGrand publication, as explained *supra*.

Furthermore, in the final Office Action, the Examiner has argued that the phantom line depiction shown in Figure 11 is an upright position, while the solid line depiction is considered a take-off angle/position. Applicants submit that the Examiner is taking liberties with language and has distorted the teachings of the LeGrand publication to make the prior art read onto the limitations of claim 1, using nothing more than impermissible hindsight reconstruction. A mere glance at Figure 11 reveals that, at the phantom line, an occupant's head would be in alignment with the feet and cannot possibly be considered the claimed "upright" position. Indeed, the position is described as a "reclining profile" in the translation of the publication. *See* Exhibit B, page 7, line 33 of the English translation. As to the solid-line position being a take-off position, Applicants argue that, as required by the National Transportation Safety Board, the back of an aircraft must be moved forward and into a fully upright position during take-off, and that the solid-line depiction of the berth of the LeGrand publication clearly does not disclose or suggest such a seat arrangement or configuration.

As to the propriety of the combination, the Examiner has put forth that the LeGrand publication teaches all of the limitations of claim 1 except for a seat that fully reclines to provide a flat surface. The Examiner alleges that this element is taught by the Bergenwall patent, and that it would have been obvious to combine the disclosure of the LeGrand publication with the Bergenwall patent to arrive at the invention of claim 1. As explained above and further here, it would not be obvious to one skilled in the art to modify the couch of the LeGrand publication to provide an upright seating position. The LeGrand publication teaches a complex structure of couches that are arranged to provide maximum packing and to allow ease of manufacture. *See* Exhibit B, page 2, lines 7 to 15 of the English translation. The Bergenwall patent teaches a crude reclining chair having no structural commonality with the couch of the LeGrand publication. There is no way that the structure taught by the Bergenwall patent would be suitable for the tiered, berth arrangement of the LeGrand publication. Indeed, the range of movement of the seat back shown in Figures 7 and 8 of the Bergenwall patent could not be accomplished with the structure taught by the LeGrand publication, as to do so would require more vertical room/height, resulting in the need to remove at least one tier, thereby sacrificing an object and advantage of the LeGrand invention. Still further, the arrangement of the Bergenwall patent comprises two separate and distinct parts. It is impossible to reconcile this structure with the carefully arranged tier structure of the LeGrand publication. In order to adopt the reclining back movement taught by the Bergenwall patent, it would be necessary to detach one end of the couch of the LeGrand publication from its mounting (see the comment above about a hammock-like mounting). Thus, the couch would be supported at one end only. Such a modification would simply not be envisaged by the

skilled person of art. Simply put, there is nothing in the teaching of the Bergenwall patent or the LeGrand publication that would provide the motivation or incentive to modify the structure taught by the LeGrand publication in order to arrive at the invention of claim 1, as suggested by the Examiner. On the contrary, in considering any modification to the structure of the LeGrand publication, the skilled artisan would simply dismiss the teachings of the Bergenwall patent as not being relevant.

Finally, even if one of ordinary skill in the art would have been motivated to combine the teachings of the LeGrand publication with those of the Bergenwall patent (and Applicants maintain that it is not), Applicants again submit that the combination does not teach the invention of claim 1. As noted *supra*, claim 1 recites that either of the seats has a seat axis *substantially parallel* to the longitudinal axis of the seating unit. In the final Office Action, the Examiner maintains that the seat axes of seats 3,4 of the LeGrand publication are substantially parallel to the longitudinal axis 18 thereof. On page 8 of the final Office Action, the Examiner does acknowledge that a "small angle is made between the seat axis and the longitudinal axis, however, this angle is so small, the lines are still considered to be "substantially" parallel." Applicants submit that the angle to which the Examiner refers is not "small". Indeed, the translation of the LeGrand publication indicates that angle **a** and **a'** is on the order of 20 and 16 degrees, respectively. These angles are not small and cannot result in the seat axes and longitudinal axes being considered "substantially parallel", as claimed by Applicants. The terms substantially parallel are intended to cover minor variations from the exact, not the angle degree disclosed in the LeGrand publication. In the absence of a teaching or suggestion for all limitations of claim 1, Applicants submit that the claim is patentable

over the art of record. Reconsideration and withdrawal of the rejection is believed proper and is therefore respectfully requested.

Other Matters

The Examiner has indicated that claims 39-50 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. By this paper, Applicants have rewritten the subject matter of claims 39-50 as new claims 53-64. Entry and allowance of new claims 53-64 is believed to be proper and is earnestly solicited.

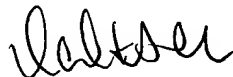
Conclusion

All of the stated grounds of objection and rejection have been properly traversed, accommodated, or rendered moot. Applicants therefore respectfully request that the Examiner reconsider all presently outstanding objections and rejections and withdraw the same. Applicants believe that a full and complete reply has been made to the outstanding final Office Action and, as such, the present application is in condition for allowance. If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

Prompt and favorable consideration of this Amendment and Reply is respectfully requested.

Respectfully submitted,

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Technical Standard Order

**Subject: TSO-C25a, AIRCRAFT SEATS AND BERTHS (TYPE I
TRANSPORT, 6G FORWARD LOAD)**

Technical Standard Orders for Aircraft Materials, Parts, Processes, and Appliances

Under section 601 of the Civil Aeronautics Act of 1938 and the delegation of authority from the Civil Aeronautics Board in § § 3.18, 4a.31, 4b.18, 6.18 and 7.18 of the Civil Air Regulations, the Administrator of civil Aeronautics is authorized to adopt performance standards and specifications of materials, parts, processes, and appliances used in aircraft as he may find necessary to implement provisions of the Civil Air Regulations. The Administrator adopted the Technical Standard Order system as a means to carry out this delegated authority. This system, in brief, provides for CAA - industry cooperation in the development of these performance standards, and a form of self-regulation by industry in demonstrating compliance with these standards. Since the original adoption of this part, which contains the C series TSO's, it has been found desirable to make clarifying editorial and format changes. Hence, Part 514 of the Regulations of the Administrator is being amended to provide two subparts. Subpart A contains the general requirements applicable to all Technical Standard Orders, such as "Method of Conformance," "Marking," and "Deviations." Subpart B contains the technical specifications to which a specific product must conform.

SUBPART A-GENERAL

§ 514.1 *Basis and purpose* - (a)

Basis. Section 601 of the Civil Aeronautics Act of 1938, as amended, and § § 3.18, 4a.31, 4b.18, 6.18 and 7.18 of the Civil Air Regulations.

(b) *Purpose.* The purpose of this part is to establish minimum performance standards for aircraft materials, parts, processes, and appliances which are to be used on civil aircraft of the United States, and to prescribe

the manner by which the manufacturer must show compliance with such performance standards.

§ 514.2 *Method of conformance.* A manufacturer of an aircraft material, part, process, or appliance for which standards are established in Subpart B of this part, prior to distribution for use on a civil aircraft of the United States, shall furnish a written statement of conformance certifying that the

material, part, process, or appliance meets the applicable performance standards established in this part. The statement of conformance shall be signed by a person duly authorized by the manufacturer, and shall be furnished to the Chief, Aircraft Engineering Division, Office of Aviation Safety, Civil Aeronautics Administration, Washington 25, D.C.

If complaints of nonconformance with the requirements of this Order are brought to the attention of the CAA and investigation indicates that such complaints are justified, the Administrator will take appropriate action to restrict the use of the product in civil aircraft.

§ 514.3 *Marking.* Materials, parts, processes, and appliances for which a statement of conformance has been submitted, shall be legibly and permanently marked with the following information:

(a) Name and address of the manufacturer responsible for compliance,

(b) Equipment name, or type or model designation,

(c) Weight to the nearest pound and fraction thereof,

(d) Serial number and/or date or manufacturer, and

(e) Applicable Technical Standard Order (TSO) number.

§ 514.5 *Deviations.* No deviation will be granted from the performance standards established in Subpart B. Requests for deviation from other requirements of this part should be addressed to the Aircraft Engineering Division, Office of Aviation Safety, Civil Aeronautics Administration, Washington 25, D.C.

Technical Standard Orders are obtainable without charge from the Civil Aeronautics Administration, Aviation Information Office, Washington 25, D.C.

SUBPART B

§ 514.35 Aircraft seats and berths (Type I transport, 6g forward load) – TSO-C25a – (a) Applicability – (1) Minimum performance standards. Minimum performance standards are hereby established for aircraft seats and berths (Type I transport, 6g forward load) which are to be used in civil aircraft of the United States. These standards apply to Type I transport seats for use in transport category aircraft for which an application for type certificate was made prior to March 5, 1952.^{1/} New models of seats and berths (Type I transport, 6g forward load) manufactured for installation in civil aircraft on or after the effective date of this order shall meet the standards of National Aircraft Standard Specification 806, revised January 1, 1956,^{2/} with the changes and exceptions listed in subparagraph (2). Seats and berths approved by the Civil Aeronautics Administration prior to the effective date of this order may continue to be manufactured under the provisions of their original approval.

(2) Exceptions. (i) The ultimate loads corresponding to the aircraft reduced weight gust load factor or the airplane designer's special requirements may exceed the ultimate down loads for Type I seats specified in subsection 4.1.2 of NAS 806. For the purpose of this

^{1/} Standards for Types II, III, IV, and I (for installation in aircraft for which an application for type certificate was made after March 5, 1952,) are contained in TSO-C39.

^{2/} Copies may be obtained from the National Standards Association, 616 Washington Loan and Trust Building, Washington 4, D.C.

order, in order to provide for such loading conditions, the ultimate down loads specified in Table I of 4.1.2 for Type I seats shall be 1,000 pounds (6g) instead of 765 pounds.

(ii) To insure that pilot and copilot seats will provide for the rearward loads resulting from the application of pilot forces to the flight controls, such seats shall withstand a rearward load of 450 pounds. The load shall be applied 8 inches above the intersection of the seat back with the seat bottom.

(iii) The weight of the seat or berth times the appropriate "g" value shall be added to the design ultimate load specified in subdivision (i) and in subsection 4.1.2 of NAS 806.

(iv) For the purpose of this order, 4.3(c) of NAS 806 should read: "that the structure is capable of supporting without failure for at least 3 seconds the ultimate loads specified in this order when applied separately."

(b) Marking. The weight required in § 514.3 need not be included.

(c) Effective date. January 15, 1957.



Date: 4/17/87

Technical Standard Order

Subject: TSO-C39b, AIRCRAFT SEATS AND BERTHS

a. Applicability.

(1) Minimum Performance Standards. This technical standard order (TSO) prescribes the minimum performance standards that aircraft seats and berths of the following types must meet in order to be identified with the applicable TSO marking:

- Type I - Transport (9g forward load)
- Type II - Normal and Utility
- Type III - Acrobatic
- Type IV - Rotorcraft

Seats and berths that are to be so identified and that are manufactured on or after the date of this TSO must meet the minimum performance standards set forth in National Aircraft Standard (NAS) Specification 809, dated January 1, 1956, with the exceptions covered in subparagraph a.(2) of this TSO. Seats and berths approved prior to the date of this TSO may continue to be manufactured under the provision of their original approval.

(2) Exceptions.

(i) The sideward loads as specified in 4.1.2. Table I of NAS 809 need not exceed the requirements of the applicable Federal Aviation Regulations (FAR).

(ii) In lieu of compliance with 2.1, 3.1.2, and 4.3.2 of NAS 809, materials in Type I seats must comply with the fire protection provisions of FAR Section (§) 25.853, including the requirements of § 25.853(c), effective 11/26/84. Materials in Type I berths must comply with the fire protection provisions of § 25.853(b).

Passenger Seat Certification Requirements (How changes are made) :

Type Certificate – Airframe Certification.

Airframe manufacturers hold and are responsible for proof of airframe conformance with the TC.

A Master Change or Service Bulletin is used for airframe modifications. These should be incorporated into the TC.

Supplemental Type Certificate (or local authority approved modifications) – Airframe Modifications.

STC applicant holds and is responsible for proof of conformance against aircraft TC.

FAA Technical Standing Order & CAA Declaration of Design & Performance approval – Seat Certification.

Note: OEMs (original equipment manufacturers) hold and are responsible for proof of seat conformance with TSO & DDPs.

Service Bulletin (or local authority approved modifications) used for seat modifications. These should be incorporated into TSO or DDP and comply with applicable legislation.

JAR 145 – Seat Overhaul & Maintenance Certification.

JAR 145 holders responsible for proof of seat conformance to approved data. (CMMs –Component Maintenance Manuals- & Service Bulletins).

JAR 21 – Seat Modifications.

JAR 21 holders responsible for generation of Service Bulletin (or local authority approved modifications) used for seat modifications and proof that changes conform with and are incorporated in TSO or DDP and comply with applicable legislation.

Seat Design & Installation Criteria. (Headline, not exhaustive).

Legislation:

JAR/FAR 25.561 Static Strength Requirements.

JAR/FAR 25.562 Emergency Landing & Dynamic Strength Requirements.

JAR/FAR 25.785 Requirements for Compartment Interiors.

JAR/FAR 25.853 Flammability Requirements.

CAA AWN 79 Emergency Exit Requirements

CAA AWN 64 Minimum Space for Seated Passengers.

CAA AWN 19 Bogus Parts

CAA AWN 58 Continuance of Flammability Requirements.

Design Standards:

TSO C39b Requirements for A/C Seats & Berths.

TSO C127 Requirements for A/C Seating Systems.

Advisory Data:

AC 25.562-1A Dynamic Certification.

AS8049 Dynamic Certification

D6-36230 Boeing Passenger Seat Design & Interface Criteria.

ABD0031 Gaseous Toxic Levels.

BA Policy:

CABGEN 3 Electrical Requirements.

CABGEN 5 Cabin Power Isolation.

CABGEN 8 16G Requirements.

Acronym Legend:

FAA: U.S. Federal Aviation Authority

CAA: United Kingdom Civil Aviation Authority

TSO: Technical Standard Order of the FAA

JAR: Joint Aviation Requirements (determined by the Joint Aviation Authorities (JAA), a European body set up by the member states of the European Civil Aviation Conference (ECAC).

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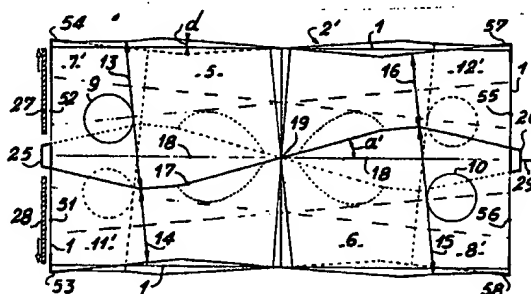
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54 Disposition nouvelle d'aménagement de véhicules et de lieux de transit.

57 Un aménagement de véhicules comprenant au moins une suite de modules (2') contenant chacun un faisceau de sièges allongés (3, 4), à profil de relaxation voire couché, occupant chacun les 100 % de la longueur du module, dont la largeur décroît vers l'extrémité des pieds, ces sièges superposés sur plusieurs niveaux et accessibles latéralement par un couloir (84) doté d'une échelle (46), étant disposés en tête-bêche à chaque niveau et en tête-bêche d'un niveau à l'autre, caractérisée en ce que chaque siège est tronçonné transversalement en trois fractions à savoir une fraction-milieu principale (5, 6) d'environ 70 % qui vue en plan, est un trapèze symétrique interchangeable à l'état fini, insérée entre deux panneaux plans rembourrés dissymétriques d'environ 15 % chacun (7', 8') et (11', 12'), respectivement de tête et de pieds, chacun interchangeable à l'état nu.



EP 0 036 822 A1

La présente invention concerne un aménagement de véhicules de transport en commun par rail, route, air, mer, et accessoirement de lieux de transit.

Elle applique, en particulier, les techniques connues du demandeur dans ses brevets, notamment français à savoir, le brevet n° 71.26437 du 20 Juillet 1971 et son additif n° 71.38309 du 25 Octobre 1971, ainsi que le brevet n° 77.27816 du 14 Septembre 1977.

Ces techniques connues consistent principalement en au moins une suite de modules, transversaux ou longitudinaux par rapport à l'axe du véhicule, chaque module contenant un faisceau de sièges allongés, à pro-
10 fil de relaxation voire couché, occupant chacun les 100% de la longueur du module, dont la largeur vue en plan décroît régulièrement vers l'extrémité des pieds, ces sièges, superposés sur quatre niveaux notamment et accessibles latéralement par un couloir doté d'une échelle, étant
15 disposés en tête-bêche à chaque niveau par paire juxtaposée, et en tête-bêche également d'un niveau à l'autre, l'isolement de ces sièges entre eux étant complété primo par une cloison gauche médiane qui à chaque niveau sépare lesdits sièges juxtaposés et qui porte des poches recevant les coudes internes, secundo par des parois fermant les extrémités du module.

Dans le cas particulier d'une voiture de chemin de fer, qu'elle soit
20 de type transversal à compartiments fermés par portes coulissantes, ou de type longitudinal, lesdites techniques connues portent également sur les WC-lavabos cylindriques, les rangements de bagages, les armoires d'appareillages, les couloirs de circulation, les portes d'accès notamment.

Ces techniques connues présentent de nombreux avantages dont celui
25 paradoxal et primordial de procurer à la fois plus de sièges allongés et plus de confort d'ensemble pour chacun d'eux, dans un volume limité. Par confort d'ensemble, il faut entendre non seulement le confort des sièges mais également la satisfaction de tous les besoins successifs de chacun. Lesdits éléments coopèrent donc étroitement de manière indissociable pour
30 l'obtention dudit avantage paradoxal primordial, qui seul importe.

Il subsiste cependant certaines imperfections auxquelles remédie la présente invention. Par exemple lesdits sièges présentent trois inconvénients. Primo ils sont de deux fabrications différentes selon qu'ils sont de niveau pair ou impair. Secundo étant allongés, en portée de 100% d'un
35 seul tenant, leur structure est relativement épaisse. Tertio leur contour plan est un trapèze rectangle dissymétrique mal approprié au corps humain.

Selon une première caractéristique de l'invention, chaque siège allongé sur les 100% de la longueur du module, est tronçonné transversalement en trois fractions à savoir, une fraction-milieu principale de 70%
40 environ recevant buste et jambes, insérée entre une fraction de 15% environ recevant la tête et une fraction de 15% environ recevant les pieds, ladite fraction-milieu étant vue en plan un trapèze symétrique qui à l'état fini est identique à même niveau et d'un niveau à l'autre, donc d'une

première série interchangeable; la fraction-tête étant avant rembourrage un simple panneau plan quadrilatéral dissymétrique identique à même niveau, et retourné d'un niveau à l'autre latéralement face pour face, donc d'une deuxième série interchangeable à l'état nu; et de même pour la 5 fraction-pieds qui forme une troisième série interchangeable à l'état nu. La finition, rembourrage, habillage et attaches, de chacune de ces deux séries de panneaux nus diffère selon le niveau c'est à dire selon la face employée, mais cette diversité ne complique nullement leur fabrication.

D'autres caractéristiques de l'invention apparaîtront au cours de la 10 description qui va suivre, donnée uniquement à titre d'exemple.

Les fig. 1 et 2 sont les vues en plan d'une paire de sièges 3,4 allongés, juxtaposés en tête-bêche, tronçonnés en 7,5,12 et 8,6,11, selon l'invention, en modules longitudinaux (fig.1) et transversaux (fig.2).

La fig. 3 est une coupe de voiture de chemin de fer, de type trans- 15 versal, avec échelle fixe 46 dans un compartiment 37.

La fig. 4 est la vue en plan des raidisseurs verticaux 57,26,58, et des goussets de soutien T,P, conformes à la fig. 3.

La fig. 5 est la vue en plan de la fig. 3.

La fig. 6 est en plan une extrémité de voiture de chemin de fer, avec 20 deux WC-lavabos cylindriques 70,71, et armoires d'appareillages 76,77.

Les fig. 7 à 10 sont, de profil et de face, une échelle articulée 84, en variante de l'échelle fixe 46 des fig. 3,5,6.

Les fig. 11 à 13 de profil sont une fraction-milieu 102 articulée.

La fig. 14 est une variante de la fig. 5, avec passage transversal 25 milieu 116, débouchant sur deux portes d'accès supplémentaires 117,118.

La fig. 15 est une variante cylindrique des raidisseurs de la fig.4.

La fig. 1 montre l'implantation rectangulaire 1 d'un module 2, de 30 longueur 184 cm et largeur 90 cm environ, contenant à chaque niveau deux sièges allongés en tête-bêche 3,4, tronçonnés chacun en trois fractions à savoir, deux fractions-milieu 5,6, identiques à profil de relaxation et vues en plan en forme de trapèzes symétriques d'angle α , 20 degrés; deux panneaux plans inclinés de tête 7,8 identiques avec emplacement 9,10 des têtes; et deux panneaux plans inclinés des pieds 11,12 également identiques. Les jonctions des trois fractions se font suivant deux lignes hori- 35 zontales, 13,14 distinctes d'une part, et 15,16 distinctes d'autre part.

La cloison gauche médiane 17, sépare les sièges juxtaposés, par des portions de plans verticaux qui à chaque niveau font avec le plan médian 18 un angle α , 20 degrés, dont le sens alterne d'un niveau à l'autre.

Ces sièges tronçonnés en 7,5,12 et 8,6,11 sont identiques d'un ni- 40 veau à l'autre, et à chaque niveau ils peuvent coïncider par une rotation de 180 degrés autour de l'axe vertical central 19 du module.

La cloison médiane 17 porte des poches 20, de profondeur b , 10 cm, pour loger les coudes internes. On voit sur la fig.3, chaque poche 20 de

hauteur g, 13 cm, située entre les deux profils de relaxation 21,22. Le tronçonnement des sièges en trois réduit à 70% la portée de la fraction-milieu réduisant ainsi l'épaisseur de sa structure, si bien que son épaisseur de 5 cm habillée peut être réduite à 3 cm. Il s'ensuit deux avantages simultanés, primo la réduction de 2 cm du pas vertical h des niveaux à aisance égale des occupants, ce qui contribue par effet cumulatif à la création d'un cinquième niveau 30,31 (fig.3) sous gabarit réglementaire 33, secundo la majoration de 2 cm de la hauteur g des poches 20. On notera qu'à ces deux places 30,31 supplémentaires, dix au lieu de huit par compartiment 37, correspond une extension en hauteur des rangements de bagages 47,48 et 49, égale à ce même pas vertical h.

On voit sur le module longitudinal 2 de la fig.1, que le contour externe des pieds débordé de 10 cm du contour 1, comme hachuré en 23,24. Ce débordement ne serait pas possible dans un module transversal 2', fig.2, car il rétrécirait de $2 \times 10 = 20$ cm à la fois l'entrée et le fond du compartiment 37. Aussi la fig.2 montre les mêmes fractions-milieu 5,6 qu'en fig.1, mais après pivotement d d'environ 4 degrés autour de l'axe 19 précité, et la cloison 17 ne fait plus qu'un angle a' de $20 - 4 = 16$ degrés avec le même plan médian 18 du module. Moyennant quoi, les débordements de 10 cm sur les quatre verticales des quatre coins du module, sont remplacés par des débordements réduits à 3.5 cm, répartis sur huit verticales, à savoir, les précitées aux quatre coins, et quatre autres verticales intermédiaires qui laissent intact c'est à dire sans débordement le milieu des flancs du module au droit des échelles d'accès 46. Les panneaux 7',8' de tête et 11',12' des pieds (fig.2) sont différents de ceux 7,8,11,12 (fig.1) en raison de ladite rotation de 4 degrés.

On voit sur la fig.3, le couloir latéral 34, avec strapontins 35 de diversion et filet 36, puis un demi-compartiment 37' et ses quatre sièges 38,39,40,41 en tête-bêche respectivement avec les quatre autres 42,43,44 45 du compartiment voisin situé derrière la cloison médiane. On voit également l'échelle fixe verticale centrale 46, ainsi que les divers rangements de bagages à savoir, 47,48 au fond à gauche, 49 au dessus du couloir, 50 tout en haut, et enfin sous les sièges 38,42 au niveau du sol.

Lesdits sièges superposés et tronçonnés sont fixés aux deux extrémités du module par les parois 51,52 et 55,56 raidies par les profilés verticaux 53,54,57,58 en équerre aux angles, et 25,26 médians trapézoïdaux, tous ces profilés étant solidaires de goussets T de tête et P de pieds (Fig.4), à raison de quatre par niveau à savoir, T2,T'2 et P2,P'2 pour les panneaux 8' de tête et 12' de pieds, du niveau 2 dessiné en fig.2. De même, T1,T'1,P1,P'1; T3,T'3,P3,P'3; T4,T'4,P4,P'4; respectivement pour les autres niveaux 1,3 et 4.

Sur la fig.3, on ne voit que les goussets T1,P1;T2,P2;T3,P3;T4,P4. Tous ces goussets supportent lesdits panneaux de tête ou pieds tels 8' ou

12' par leurs arêtes supérieures 60,61 et supportent les bords 15,16 des fractions-milieu 5,6 par leurs tranches d'extrémité 62,63.

Le profilé médian 25 extérieur au module s'insère entre les deux portes coulissantes 27,28, et l'autre 26 raidit la cloison verticale 29 5 de séparation des compartiments voisins 37, au fond de ceux-ci.

On retrouve sur la fig. 5 les détails des fig. 2 et 3 à savoir, le couloir latéral 34; les parois d'extrémité 51,52,55,56 raidies par les profilés 25,26 médians et 53,54,57,58 d'angle; la cloison médiane 17 prolongée jusqu'aux extrémités du module; la cloison 29; les couloirs 10 internes 64 dotés de leurs échelles fixes 46.

La fig. 6 montre une extrémité de voiture de chemin de fer, avec plateforme 65; portes 66 inter-voitures; portes 67,68 d'accès au quai; WC-lavabos 70,71 avantageusement deux, soit quatre par voiture, symétriques du plan longitudinal 69, à parois et portes cylindriques 72,73; 15 couloir latéral 34; porte battante 74; et retour du couloir de l'autre côté en cul-de-sac 75 pour l'accès au WC(71) opposé au couloir(34); et enfin les armoires d'appareillages 76 en tête des WC 70,71, mais aussi en fond 77 dudit cul-de-sac 75.

Les creux et bosses des protubérances locales aux quatre niveaux du 20 demi-module 81 sont mariés avec les bosses et creux des lavabos 82,83, de façon à gagner en compacité sans toucher à l'aisance des usagers.

Le remplacement des échelles verticales fixes 46 des fig.3,5,6, par l'échelle articulée 84 des fig. 7 à 10, à deux positions inclinées d'environ 10 degrés, permet de diminuer sensiblement la largeur des couloirs 25 internes des compartiments 37, par exemple de plus de 10 cm à aisance au moins égale au passage le long d'elle, des pieds, des hanches, et des épaules, l'usage de l'échelle étant de plus facilité par son inclinaison. Ce gain cumulatif contribue à la création d'un compartiment supplémentaire. Sur les fig.7,8, de profil et de face, l'échelle articulée 84 pivote au- 30 tour d'un axe 85, situé dans le plan médian du couloir interne 86, cet axe étant logé de préférence sous le plancher 87 de la voiture.

La partie inférieure de l'échelle est constituée de un ou deux plats raidés 88 dont les prolongements 89 coulissent dans les creux des montants 90 de l'échelle 84 dont la partie supérieure est articulée autour 35 d'un axe 91 parallèle à l'axe 85, avec un fourreau 92 portant une ou deux bagues 93,94 qui, selon le sens du basculement fléché 95,96, tombent et se bloquent dans l'un des deux creux 97,98, ou méplats supérieurs, pratiqués aux deux extrémités d'un tube 99 longitudinal fixé sous la voûte 100. L'échelle est légère. Son déblocage se fait en la soulevant à la main.

40 Un cuir 101 accompagnant le pied des plats 88, couvre le creux du plancher 87 dans le débattement de l'échelle.

La fig. 9 est une vue agrandie du haut de l'échelle 84.

La fig.10 est une variante de l'axe 85, le ou les plats 88 étant ici

solidaires d'un cylindre 85' tournant entre deux paires de rouleaux 85", l'axe fictif de rotation étant avantageusement très en dessous du plancher.

Les fig. 11 à 13 montrent, de profil, les trois axes de rotation horizontaux et sensiblement transversaux de la fraction-milieu 102 des 5 sièges à savoir, 103 en tête, 104 en bas du profil de relaxation, 105 au pied, avec liaison coulissante jumelée des tubes 106 dans leurs fourreaux 107. Les billes 108 appuyées par le ressort 109 se coincent automatiquement contre le cône 110 et bloquent le ressort de compensation 111 sous le poids du corps. Le décoincage des billes 108 se fait par la 10 rette 112, avec un levier 113 à portée de main, ou encore de pied, actionnant la pièce 114 au travers du contre-ressort 115, à condition que le corps se cambre légèrement, donc à la seule volonté de l'occupant.

La fig. 14 représente, dans une voiture de chemin de fer de type transversal à couloir latéral unique 34, un passage milieu transversal 15 116 débouchant sur deux portes d'accès coulissantes supplémentaires 117, 118, avec leurs logements 119, 120. Ceci diminue, de près de moitié, le trajet intérieur moyen entre portes d'accès 117, 67 ou 118, 68 et sièges. Ce passage 116, à nombre de sièges au moins égal, est obtenu par le gain précité dû aux échelles 84, et par la réduction des plateformes 65, car 20 la circulation est en partie dérivée sur les nouvelles portes 117 ou 118.

Les contours gauches des deux demi-modules 121, 122 peuvent être recouverts et complétés par des armoires d'appareillages non dessinées.

Avec un nombre impair de compartiments, ledit passage 116 peut être inséré entre deux demi-compartiments 37' fermés chacun par paroi et porte 25 latérales, cylindriques ici encore, non dessinées, incluant l'échelle.

La fig. 15, en variante des fig. 2 à 6 représente à chaque extrémité des modules, une structure-support verticale composée par moitiés, de deux parois cylindriques 123, 124 et 125, 126, donc déjà rigides en soi de ce fait, mais de plus renforcées localement, en particulier par des 30 tronçons de profilés verticaux triangulaires, alternés d'un étage 127, 128 à l'autre 129, 130, qui n'empiètent pas sur les volumes utilisés effectivement, étant situés chacun dans un espace mort.

Il est de plus remarquable que ces parois cylindriques 123, 124 et 125, 126 conservent pratiquement le volume de l'habitat, car leurs axes 35 verticaux se trouvent aux intersections 131 ou 132 des plans verticaux de symétrie des fractions-milieu 5, 6, communs aux divers niveaux.

Les compartiments sont pourvus de portes coulissantes, cylindriques coaxiales, en position 133, 134 fermée ou 135, 136 ouverte.

Le résultat en est encore un gain d'espace utilisé. Déjà les parois 40 simples 51, 52 et 55, 56 raidies, remplaçant des cloisons classiques d'épaisseur 2 cm ont fait gagner près de 4 cm dans la largeur de la voiture. Mais plus encore, par le remplacement des parois planes 51, 52, 55, 56 par des parois cylindriques 123, 124, 125, 126 qui n'amenuisent pas l'habitat,

d'une part au fond des compartiments 37 on majore de près de 2 cm l'épaisseur utilisée des rangements de bagages 47,48 grâce à leurs entrées évasées 137,138, et d'autre part du côté du couloir latéral 34, on gagne encore près de 3 cm dans la largeur de la voiture, par la suppression du profilé 25 de 4 cm et par le remplacement des portes planes 27,28 épaisses par des portes cylindriques 135,136 peu épaisses.

En outre la forme arrondie de ces portes leur fait conserver en position fermée 133,134 une sur-largeur du couloir 34, à cet endroit 139 qui se répète à de courts intervalles, ce qui facilite les croisements.

10 A noter qu'avec les portes-milieu 117,118, l'ossature inférieure de la voiture se rétrécit au droit des échancrures latérales ainsi créées, de façon à respecter la continuité de la structure longitudinale.

A noter également que le profil le plus bas de la fraction-milieu 102 articulée correspond à ceux de la fig. 3. Chacun ne peut donc gêner 15 son voisin, les variations se faisant à l'intérieur de son propre volume.

Enfin, couronnant la sensation de grand confort d'ensemble, on notera la constante combinaison de l'esthétique de chaque dispositif avec sa fonction telle que décrite dans la description qui précède à savoir, les 20 sièges allongés eux-mêmes en double tête-bêche, les goussets-support, les parois et portes cylindriques des compartiments, le profil de relaxation articulé plus ou moins dormant, l'échelle articulée d'usage incliné plus facile et donnant plus d'aisance au passage, les parois et portes cylindriques des quatre WC-lavabos, le cinquième niveau et le passage-milieu diminuant de près de moitié le trajet intérieur avec les bagages en main.

25 A noter deux précisions. Primo, les sièges allongés à profil de relaxation et de largeur décroissante vers les pieds, en double tête-bêche, diminuent de moitié le volume individuel à aisance égale du corps: 0,75 en hauteur avec quatre étages au lieu de trois, 0,75 en largeur avec 60+30 = 90 cm au lieu de 60+60 = 120 cm, et 0,91 en longueur avec 184 cm 30 pour une taille développée de 202 cm. Or, $0,75 \times 0,75 \times 0,91 = 0,51$.

Secundo, la paroi cylindrique des WC-lavabos focalise et superpose les trois surfaces fonctionnelles S1, S2, S3 respectivement pour entrée-sortie, usage du WC, et usage du lavabo, supprimant ainsi (S2 + S3) à aisance conservée pour chacune des trois fonctions précitées successives.

35 La description qui précède confirme à quel point tous les éléments composants du véhicule, apparemment disparates, interfèrent au contraire étroitement, par leurs dimensions, leur nombre et/ou leurs formes, pour ce résultat paradoxal primordial, d'une amélioration à la fois du confort d'ensemble offert à chaque voyageur, et du nombre de voyageurs, dans le 40 même volume inchangé.

REVENDICATIONS

1. Disposition d'aménagement de véhicules de transport en commun, par rail, route, air, mer, et accessoirement de lieux de transit, comprenant au moins une suite de modules transversaux ou longitudinaux par rapport à l'axe du véhicule, chaque module contenant un faisceau de sièges allongés, à profil de relaxation voire couché, occupant chacun les 100% de la longueur du module, dont la largeur vue en plan décroît régulièrement vers l'extrémité des pieds, ces sièges, superposés sur plusieurs niveaux et accessibles latéralement par un couloir(64) doté d'une échelle (46), étant disposés en tête-bêche à chaque niveau par paire juxtaposée (3,4), et en tête-bêche(38,39 ou 42,43) d'un niveau à l'autre, l'isolement de ces sièges entre eux étant complété par une cloison gauche médiane(17) séparant à chaque niveau lesdits sièges juxtaposés(3,4), et par des parois(51,52) fermant chaque extrémité du module, caractérisée en ce que chaque siège est tronçonné transversalement en trois fractions à savoir, une fraction-milieu principale(5,6) d'environ 70% recevant buste et jambes, qui vue en plan est un trapèze symétrique, et à l'état fini est identique à même niveau et d'un niveau à l'autre, donc interchangeable à l'état fini, et qui en module transversal est tourné de quelques degrés autour de l'axe (19), cette fraction-milieu(5,6) étant insérée entre deux panneaux plans rembourrés dissymétriques d'environ 15% chacun, (7,8 ou 7',8') pour tête et(11,12 ou 11',12') pour pieds, chacun étant identique à même niveau et retourné face pour face d'un niveau à l'autre, chacun, de tête ou de pieds respectivement étant interchangeable, mais à l'état nu seulement.

2. Disposition selon la revendication 1 caractérisée en ce que la fixation de ces sièges superposés et tronçonnés est assurée à chaque extrémité du module par une structure verticale composée de parois planes (51,52,55,56) raidies par des profilés verticaux, deux en équerre d'angle (53,54,57,58) et un médian (25,26) trapézoïdal de même épaisseur que les portes coulissantes(27,28) de compartiment(37), cette structure verticale étant solidaire de goussets (T,P,T',P') qui par leurs arêtes supérieures (60,61) supportent lesdits panneaux(7,8,7',8') de tête et(11,12,11',12') de pieds, et aux bouts(62,63) desquels sont accrochés les bords(13,14,15,16) desdites fractions-milieu(5,6), l'ensemble, sièges tronçonnés et structures de support étant démontable en un nombre réduit de standards.

3. Disposition selon la revendication 2 caractérisée en ce que ladite structure verticale solidaire des goussets, est constituée principalement par ladite paroi verticale, mais rigide en soi car galbée en deux moitiés cylindriques (123,124,125,126) à renforts locaux triangulaires verticaux(127,128,129,130) alternés par niveau, et dont les axes(131,132) sont aux intersections des plans verticaux de symétrie communs aux fractions-milieu des divers niveaux, avec entrée évasée(137,138) des rangements (47,48), et sur-largeurs périodiques(139) du couloir(34) grâce aux portes cylindriques(133,134,135,136) coaxiales aux parois cylindriques(123,124).

4. Disposition selon la revendication 1 caractérisée en ce que ladite fraction-milieu(102), à profil de relaxation, est articulée suivant trois axes de rotation parallèles horizontaux et sensiblement transversaux, situés respectivement en tête (103), au bas du profil (104), et au pied(105) où une liaison coulissante jumelée entre tubes(106)et fourreaux (107), munie de ressorts de compensation(111), s'oppose au poids du corps avec blocage en toute position, et déblocage par cambrure de l'occupant.

5. Disposition selon la revendication 1 caractérisée en ce que l'échelle(84)d'accès aux sièges superposés pivote autour d'un axe horizontal(85)parallèle aux sièges, situé de préférence sous le plancher, au besoin, par le moyen d'un cylindre(85')solidaire du bas(88)de l'échelle et qui coulissera entre deux paires de rouleaux(85''), avec coulisement du pied (88,89) dans les montants(90) de l'échelle dont la partie supérieure est articulée sur un fourreau(92)coulissant sur un tube horizontal(99)perpendiculaire à l'axe inférieur précité(85), ce tube(99)présentant à ses deux extrémités un creux (97,98) où vient se bloquer une bague (93,94) portée par ledit fourreau(92), avec déblocage par levée de l'échelle à la main.

6. Disposition selon la revendication 1 caractérisée en ce que dans une voiture de chemin de fer, qu'elle soit de type transversal à compartiments, ou de type longitudinal, sont disposés, de façon connue, quatre WC-lavabos, à savoir deux(70,71)par extrémité, symétriques par rapport à un plan longitudinal (69), et à cloisons et portes cylindriques (72,73), avec dans le type précité transversal, un retour du couloir unique (34) en cul-de-sac (75) pour l'accès au WC-lavabo(71)opposé au couloir(34)avec armoire d'appareillages (77) au fond dudit cul-de-sac.

7. Disposition selon la revendication 1 caractérisée en ce que le faible pas vertical h des sièges à profil de relaxation et en tête-bêche (38,39 ou 42,43) à aisance au moins égale du corps, et la faible épaisseur e des sièges due à leurs tronçonnements, sont combinés, d'une part avec les poches (20) de la cloison médiane (17), et d'autre part avec un cinquième niveau (30,31), à l'intérieur du gabarit-limite réglementaire.

8. Disposition selon l'une quelconque des revendications 5,6,7, caractérisée en ce que, dans une voiture de chemin de fer de type transversal, et à nombre de sièges allongés au moins égal, on combine les échelles articulées(84) des couloirs réduits(64), les deux plateformes réduites(65) aux extrémités, et le cinquième niveau(30,31), avec un passage transversal milieu(116)débouchant sur deux portes-milieu supplémentaires (117,118)d'accès aux quais, avec rétrécissement de l'ossature inférieure de la voiture, au droit des échancrures latérales de ces portes-milieu.

9. Disposition selon les revendications 1 à 8 caractérisée en ce que l'on crée en tous points une esthétique fonctionnelle adaptée à la corpulence du corps humain et à ses mouvements successifs dans un espace limité.

FIG. 1 is a schematic diagram of a rectangular structure, possibly a cross-section of a device or a layout of a component. The diagram features several labeled regions and components:

- Regions:** Labeled with numbers 1 through 24. Regions 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, and 24 are distributed across the diagram.
- Structural Elements:**
 - 1:** The top and bottom edges of the main rectangular frame.
 - 2:** The top right corner.
 - 3:** The top left corner.
 - 4:** The bottom right corner.
 - 5:** The bottom left corner.
 - 6:** The right side of the main rectangular frame.
 - 7:** A region in the top left corner.
 - 8:** A region in the bottom right corner.
 - 9:** A circular feature in the top left corner.
 - 10:** A circular feature in the bottom right corner.
 - 11:** A region in the bottom left corner.
 - 12:** A region in the top right corner.
 - 13:** A region in the top left corner.
 - 14:** A region in the bottom left corner.
 - 15:** A region in the bottom right corner.
 - 16:** A region in the top right corner.
 - 17:** A region in the top left corner.
 - 18:** A region in the top right corner.
 - 19:** A region in the bottom right corner.
 - 20:** A region in the top left corner.
 - 21:** A region in the bottom left corner.
 - 22:** A region in the top right corner.
 - 23:** A region in the bottom left corner.
 - 24:** A region in the top right corner.
- Internal Features:**
 - 13:** A dashed line connecting the top left corner to the bottom left corner.
 - 14:** A dashed line connecting the bottom left corner to the bottom right corner.
 - 15:** A dashed line connecting the bottom right corner to the top right corner.
 - 16:** A dashed line connecting the top right corner to the top left corner.
 - 17:** A dashed line connecting the top left corner to the bottom left corner.
 - 18:** A dashed line connecting the top right corner to the bottom right corner.
 - 19:** A dashed line connecting the bottom right corner to the top right corner.
 - 20:** A dashed line connecting the top left corner to the bottom right corner.
 - 21:** A dashed line connecting the bottom left corner to the top right corner.
 - 22:** A dashed line connecting the top right corner to the bottom left corner.
 - 23:** A dashed line connecting the bottom left corner to the top right corner.
 - 24:** A dashed line connecting the top right corner to the bottom left corner.
- Arrows:**
 - 1:** An arrow pointing from the top left corner towards the center.
 - 2:** An arrow pointing from the top right corner towards the center.
 - 3:** An arrow pointing from the top left corner towards the center.
 - 4:** An arrow pointing from the bottom right corner towards the center.
 - 5:** An arrow pointing from the bottom left corner towards the center.
 - 6:** An arrow pointing from the right side towards the center.
 - 7:** An arrow pointing from the top left corner towards the center.
 - 8:** An arrow pointing from the bottom right corner towards the center.
 - 9:** An arrow pointing from the top left corner towards the center.
 - 10:** An arrow pointing from the bottom right corner towards the center.
 - 11:** An arrow pointing from the bottom left corner towards the center.
 - 12:** An arrow pointing from the top right corner towards the center.
 - 13:** An arrow pointing from the top left corner towards the center.
 - 14:** An arrow pointing from the bottom left corner towards the center.
 - 15:** An arrow pointing from the bottom right corner towards the center.
 - 16:** An arrow pointing from the top right corner towards the center.
 - 17:** An arrow pointing from the top left corner towards the center.
 - 18:** An arrow pointing from the top right corner towards the center.
 - 19:** An arrow pointing from the bottom right corner towards the center.
 - 20:** An arrow pointing from the top left corner towards the center.
 - 21:** An arrow pointing from the bottom left corner towards the center.
 - 22:** An arrow pointing from the top right corner towards the center.
 - 23:** An arrow pointing from the bottom left corner towards the center.
 - 24:** An arrow pointing from the top right corner towards the center.

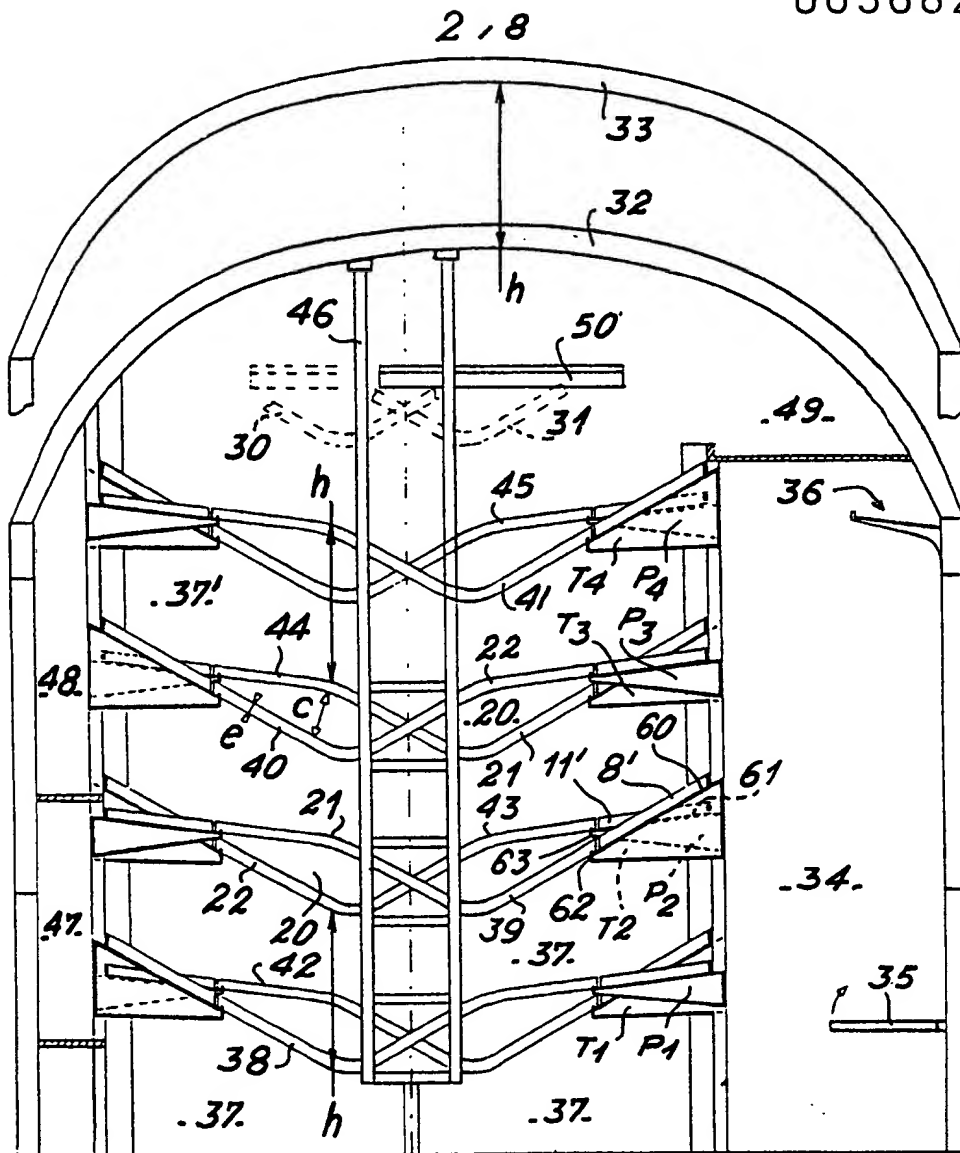
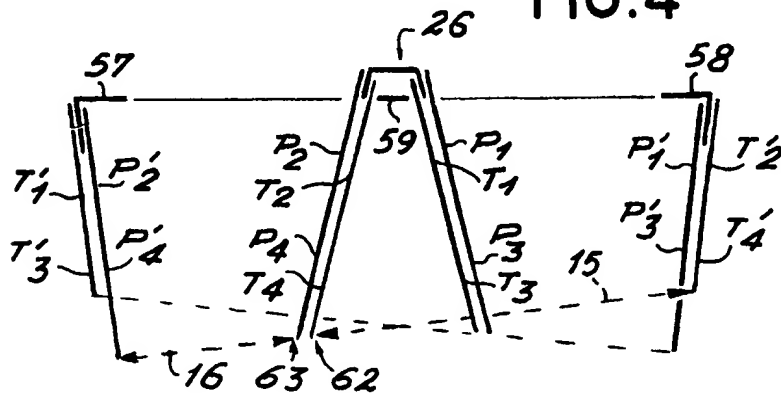
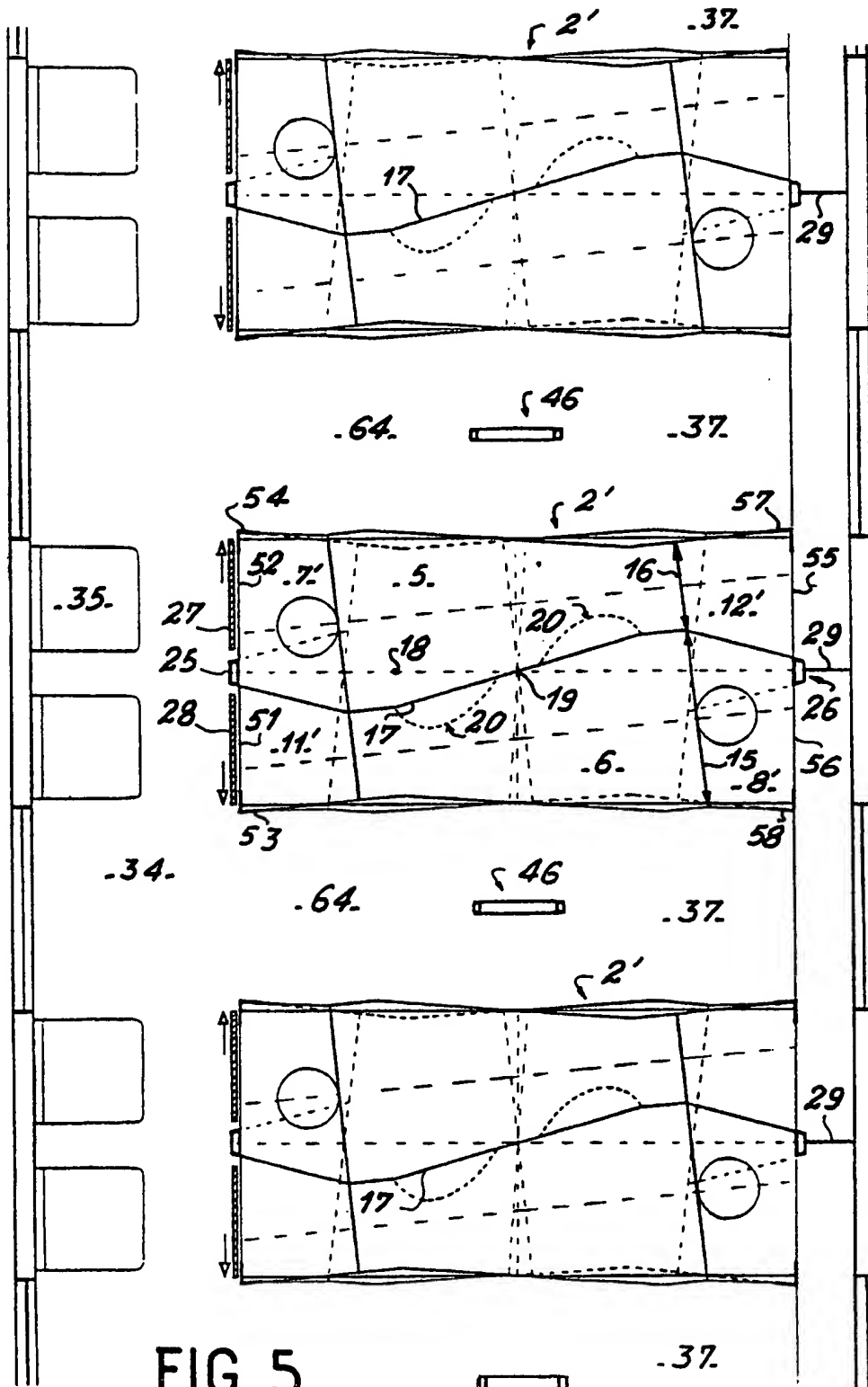


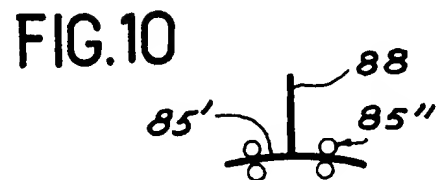
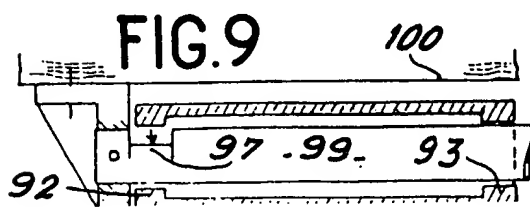
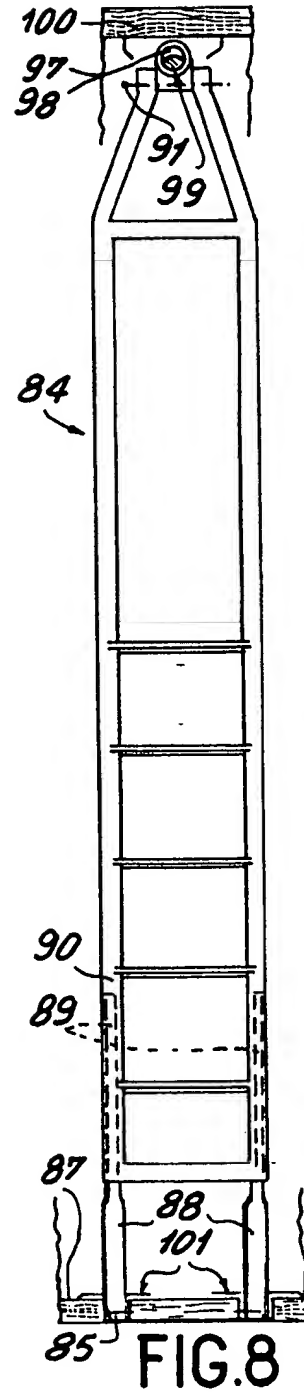
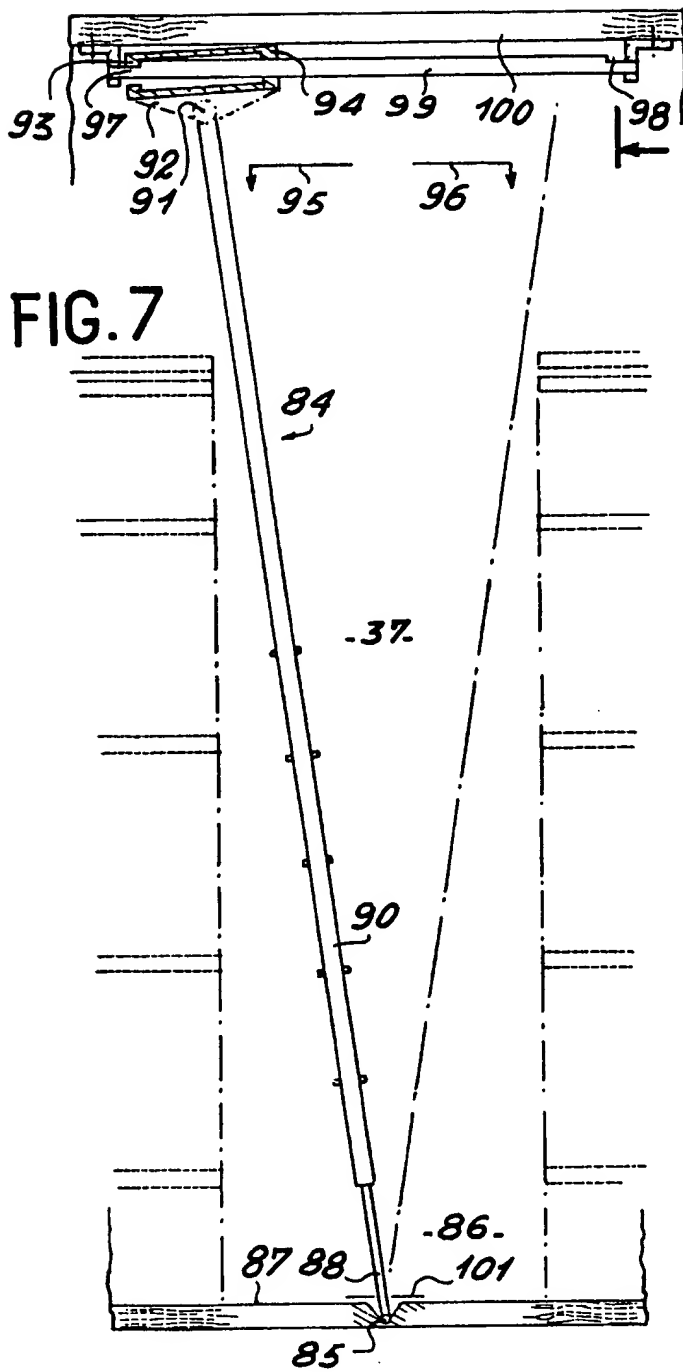
FIG. 3

FIG. 4



3,8





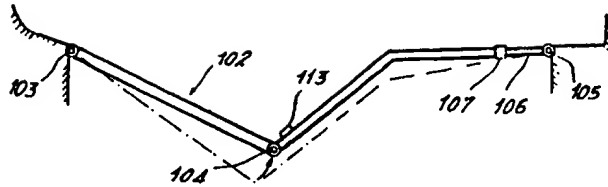


FIG. 11

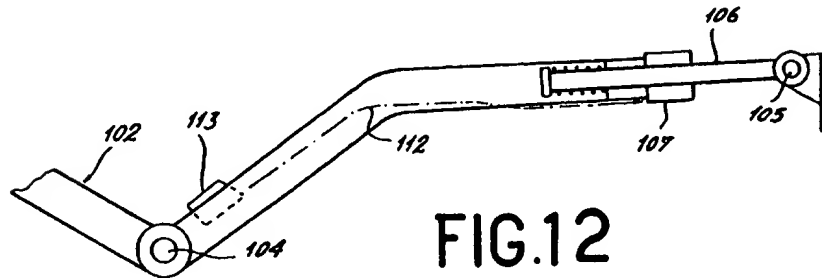


FIG. 12

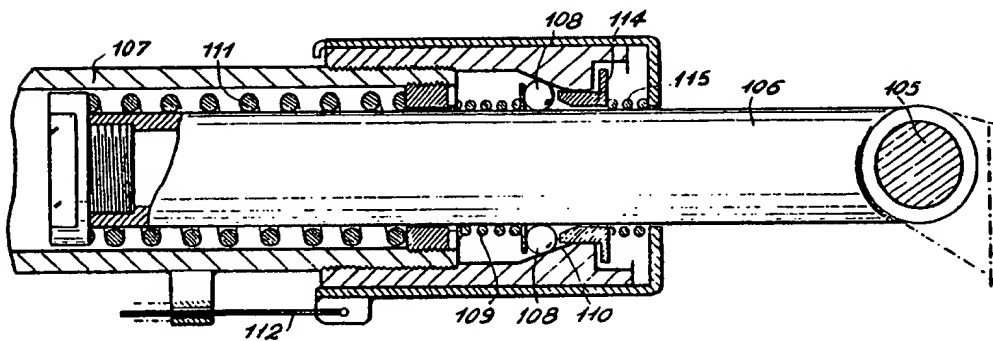


FIG. 13

FIG. 14

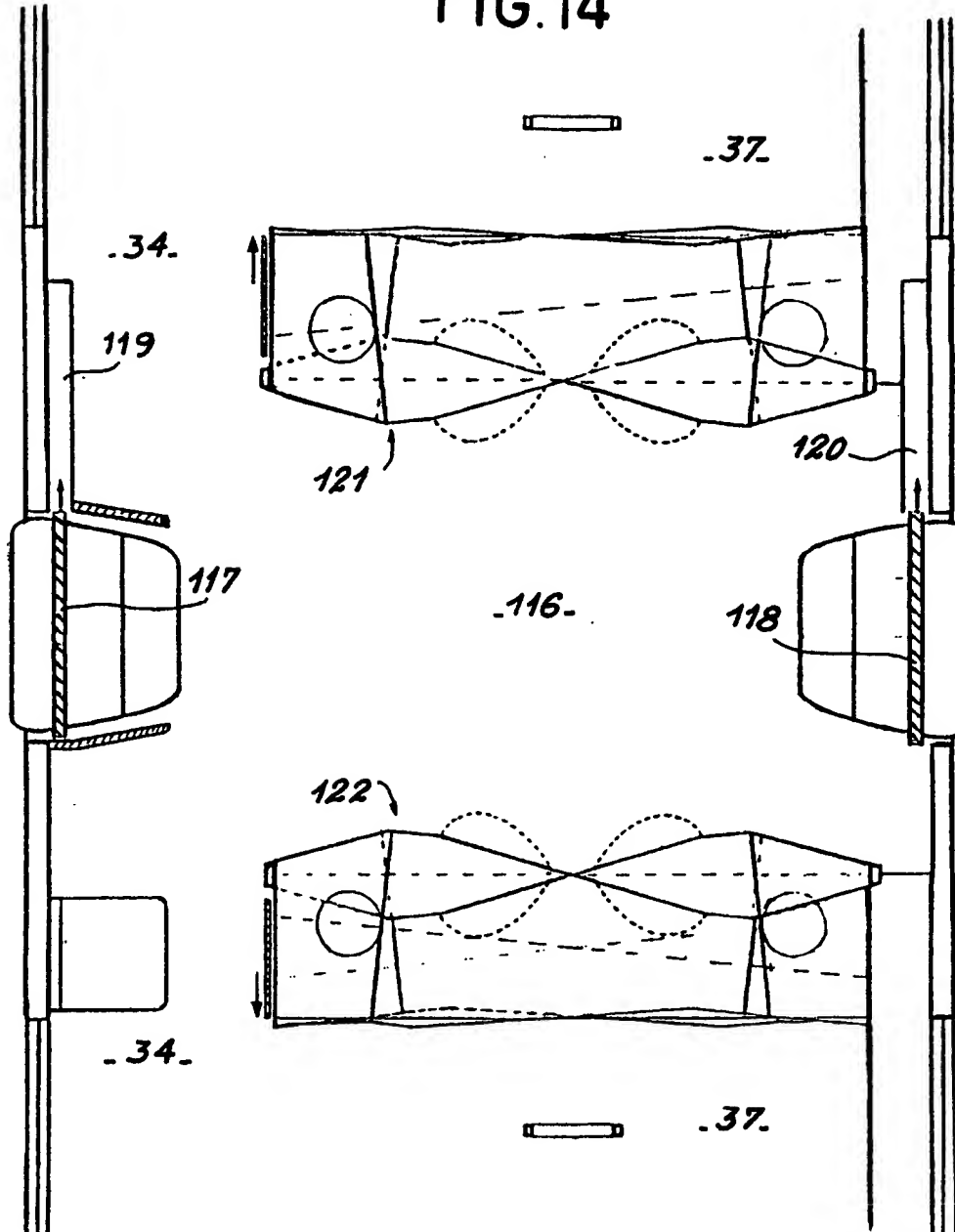
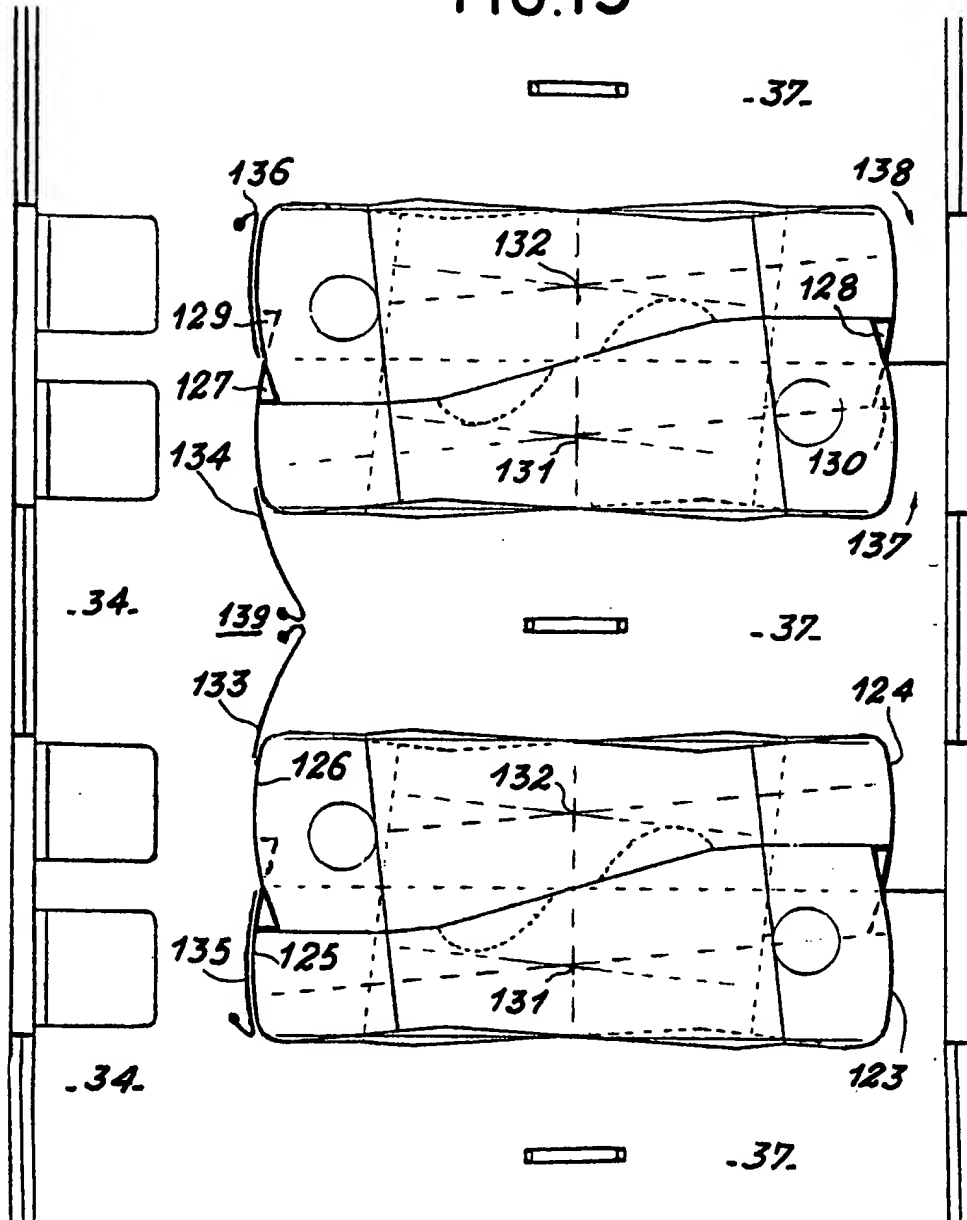


FIG.15





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RAPPORT DE RECHERCHE EUROPEENNE

0036822

Numéro de la demande

EP 81 40 0457

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Lieu de la recherche La Haye	Date d'achèvement de la recherche 18-06-1981	Examineur ESPEEL	

[Translation of European Patent 0036822]

The present invention relates to the fitting-out of public transport rail, road, air, sea
5 vehicles and, by corollary, transit areas.

It applies, in particular, the techniques disclosed by the applicant in his patents, particularly in France, namely patent No. 71/26437 of 20 July 1971 and its addition No. 71/38309 of 25 October 1971, and
10 patent No. 77/27816 of 14 September 1977.

These known techniques consist mainly in at least one series of modules, which are transverse or longitudinal with the respect to the axis of the vehicle, each module containing a set of elongate
15 seats, of reclining or even couched profile, each occupying 100% of the length of the module, whose width in plan view decreases evenly towards the foot end, these seats, superposed on four levels in particular, and accessible from the side via a corridor fitted with
20 a ladder, being arranged head to toe on each level in juxtaposed pairs, and also head to toe from one level to the next, the mutual isolation of these seats being supplemented firstly by an angled central partition which, on each level, separates the said juxtaposed
25 seats and carries pockets to take the inside elbows, and secondly, by walls which close the ends of the module.

In the particular case of a railway carriage, whether this be of the transverse type with
30 compartments closed by sliding doors, or of the longitudinal type, the said known techniques also relate to the cylindrical washrooms, the luggage storage, the equipment cupboards, the access corridors and the access doors in particular.

35 These known techniques display numerous advantages including the paradoxical and main advantage of affording both a greater number of elongate seats and greater overall comfort for each of them, in a limited volume. The term "overall comfort" is to be

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understood as meaning not only the comfort of the seats but also the ability to satisfy all the successive needs of each. The said elements therefore collaborate closely in an inseparable way to obtain the said
5 paradoxical main advantage which is the only one which is important. ?

There do, however, remain a number of imperfections which the present invention remedies. For example, the said seats have three drawbacks. Firstly,
10 their manufacture differs according to whether they are on an odd level or an even level. Secondly, being elongate, spanning 100% in one piece, their structure is relatively thick. Thirdly, their outline in plan view is an asymmetric right-angled trapezium which is
15 ill suited to the human form.

According to a first characteristic of the invention, each elongate seat over 100% of the length of the module is divided transversely into three portions, namely a main central portion representing
20 approximately 70% and taking the torso and legs, which is inserted between a portion representing approximately 15% which takes the head and a portion representing approximately 15% which takes the feet, the said central portion, when viewed in plan, having
25 the shape of a symmetric trapezium which, in the finished state, is identical across one and the same level and from one level to another, hence forming a first interchangeable series; as the head portion before padding is a simple asymmetric quadrilateral
30 flat panel which is identical across one and the same level, and inverted from one level to another laterally, side for side, it therefore forms a second series which is interchangeable in the bare state; the same is true of the foot portion which forms a third
35 series which is interchangeable in the bare state. The finishing, padding, covering and attachments, of each of these two series of bare panels differs according to the level, that is to say according to which side is

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being used, but this diversity does not in any way complicate their manufacture.

Other features of the invention will become apparent in the course of the description which will follow, which is given merely by way of example.

Figs. 1 and 2 are plan views of a pair of elongate seats 3, 4 juxtaposed head to toe, divided at 7, 5, 12 and 8, 6, 11, according to the invention, into longitudinal modules (Fig. 1) and transverse modules (Fig. 2).

Fig. 3 is a section through a railway carriage of the transverse type, with a fixed ladder 46 in a compartment 37.

Fig. 4 is the plan view of the vertical stiffeners 57, 26, 58 and of the support plates T, P, according to Fig. 3.

Fig. 5 is a plan view of Fig. 3.

Fig. 6 is a plan view of one end of a railway carriage, with two cylindrical washrooms 70, 71 and equipment cupboards 76, 77.

Figs. 7 to 10 are, in profile and face-on, an articulated ladder 84, as an alternative to the fixed ladder 46 of Figs. 3, 5 and 6.

Figs. 11 to 13, which are in profile, are an articulated central portion 102.

Fig. 14 is an alternative form of Fig. 5, with a central transverse passage 116, opening to two additional access doors 117, 118.

Fig. 15 is a cylindrical alternative form of the stiffeners of Fig. 4.

Fig. 1 shows the rectangular layout 1 of a module 2 184 cm long and about 90 cm wide, containing, at each level, two elongate seats 3, 4 head to toe, each divided into three portions, namely, two identical central portions 5, 6 with a reclining profile and which, viewed in plan, have the shape of symmetric trapezia of angle α of 20 degrees; two identical inclined flat head panels 7, 8 with a space 9, 10 for the heads; and two inclined flat foot panels 11, 12,

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which are also identical. The joints between the three portions are along, on the one hand, two separate horizontal lines 13, 14 and, on the other hand, two distinct horizontal lines 15, 16.

5 The angled central partition 17 separates the juxtaposed seats with flat vertical portions which, at each level, make, with the central plane 18, an angle a of 20 degrees, the direction of which alternates from one level to the next.

10 These seats, divided at 7, 5, 12 and 8, 6, 11 are identical from one level to the next, and in each level they can coincide through a rotation of 180 degrees about the central vertical axis 19 of the module.

15 The central partition 17 has pockets 20, with a depth b of 10 cm, to take the inner elbows. Each pocket 20, with a height c of 13 cm, located between the two reclining section pieces 21, 22 can be seen in Fig. 3. Dividing the seats into three reduces the span of the
20 central portion to 70%, thus reducing the thickness of its structure, so that its 5 cm thickness in the clad state, can be reduced to 3 cm. Two simultaneous advantages in ensue: firstly, the 2 cm reduction in the vertical spacing h of the levels for the same occupant
25 comfort, which, through a cumulative effect, contributes to the creation of a fifth level 30, 31 (Fig. 3) inside the regulatory size 33; and secondly, the 2 cm increase in the height c of the pockets 20. It will be noted that an increase in the height of the
30 luggage storage spaces 47, 48 and 49 equal to this same vertical spacing h corresponds to these two additional spaces 30, 31, 10 instead of 8 per compartment 37.

 It can be seen in the longitudinal module 2 of Fig. 1, that the external outline of the feet protrudes
35 beyond the outline 1 by 10 cm, as shown by hatching at 23, 24. This overhang would not be possible in a transverse module 2', Fig. 2, because it would narrow both the entry and the end of the compartment 37 by $2 \times 10 = 20$ cm. Hence, Fig. 2 shows the same central

- 5 -

portions 5, 6 as in Fig. 1, but after a pivoting d of about 4 degrees about the aforementioned axis 19, and the partition 17 now simply makes an angle a' of $20 - 4 = 16$ degrees with this same mid-plane 18 of the module. As a result of this, the aforementioned overhangs of 10 cm on the four verticals of the four corners of the module are replaced by overhangs which are reduced to 3.5 cm, spread across eight verticals, namely the aforementioned ones at the four corners, and four more intermediate verticals which leave the middle of the flanks of the module intact, that is to say without overhang, at the location of the access ladders 46. The head panels, 7', 8' and foot panels 11', 12' (Fig. 2) differ from those 7, 8, 11, 12 of Fig. 1 because of the said 4-degree rotation.

Fig. 3 shows the lateral corridor 34, with diversionary fold-up aisle seats 35 and nets 36, then a half compartment 37' and its four seats 38, 39, 40, 41 head to toe respectively with the other four 42, 43, 44, 45 of the adjacent compartment located behind the central partition. It also shows the fixed central vertical ladder 46, and the various luggage storage spaces namely 47, 48 at the end on the left, 49 above the corridor, and 50 right at the top, and finally under the seats 38, 42 at floor level.

The said superposed and divided seats are fixed to the two ends of the module by the walls 51, 52 and 55, 56 which are stiffened by the vertical angle section pieces 53, 54, 57, 58 at the corners and the trapezoidal central section pieces 25, 26, all these section pieces being secured to head-end plates T and foot-end plates P (Fig. 4), four per level, namely T2, T'2 and P2, P'2 in the case of the head panel 8' and foot panel 12' of level 2 drawn in Fig. 2.

Likewise, T1, T'1, P1, P'1; T3, T'3, P3, P'3; T4, T'4, P4, P'4; respectively for the other levels 1, 3 and 4.

In Fig. 3 only the plates T1, P1; T2, P2; T3, P3 and T4, P4 can be seen. All these plates support the

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said head or foot panels such as 8' or 12' via their upper edge faces 60, 61 and support the edges 15, 16 of the central portions 5, 6 via their end faces 62, 63.

The central section piece 25, outside the module, is inserted between the two sliding doors 27, 28, and the other one 26 stiffens the vertical partition 29 separating the adjacent compartments 37, at the end of these.

Fig. 5 again shows the details of Figs. 2 and 3, namely, the lateral corridor 34; the end walls 51, 52, 55, 56 stiffened by the central section pieces 25, 26 and corner section pieces 53, 54, 57, 58; the central partition 17 extended as far as the ends of the module; the partition 29; the internal corridors 64 with their fixed ladders 46.

Fig. 6 shows one end of a railway carriage with a platform 65; doors 66 between carriages; doors 67, 68 for access to the station platform; washrooms 70, 71, advantageously two of these, namely four per carriage, symmetric to the longitudinal plane 69, with cylindrical walls and doors 72, 73; lateral corridor 34; swing door 74; and the corridor returning round the other side as a dead end 75 to access the toilet (71) on the other side to the corridor (34); and finally the equipment cupboards 76 at the head of the toilets 70, 71 and also at the end 77 of the said dead end 75.

The cavities and lumps of the local protrusions at the four levels of the half module 81 are married with the lumps and cavities of the basins 82, 83 so as to improve on compactness without affecting user comfort.

Replacing the fixed vertical ladders 46 of Figs. 3, 5 and 6 with the articulated ladder 84 of Figs. 7 to 10, which has two positions inclined by about 10 degrees, makes it possible to reduce appreciably the width of the internal corridors of the compartments 37, for example by over 10 cm for at least the same level of ease of moving the feet, hips and shoulders along it, use of the ladder also being made

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easier by its inclination. This cumulative saving contributes to the creation of an additional compartment. In Figs. 7 and 8, in profile and face-on, the articulated ladder 84 pivots about an axis 85 located in the mid-plane of the internal corridor 86, this axis preferably being under the floor 87 of the carriage.

The lower part of the ladder consists of one or two stiff flat bars 88, the extensions 89 of which slide in the hollows of the uprights 90 of the ladder 84, the top of which is articulated about an axis 91 parallel to the axis 85, with a sleeve 92 carrying one or two rings 93, 94 which, depending on the direction of tilting arrowed 95, 96, drop into and lock in one of the two recesses 97, 98, or upper flats made at the two ends of a longitudinal tube 99 fixed under the bow of the roof 100. The ladder is lightweight. It can be unlocked by lifting it up by hand.

A gasket 101 accompanying the foot of the flat bars 88 covers the recess in the floor 87 in the travel of the ladder.

Fig. 9 is an enlarged view of the top of the ladder 84.

Fig. 10 is an alternative form of the axis 85, the flat or flats 88 here being secured to a cylinder 85' rotating between two pairs of rollers 85'', the imaginary axis of rotation advantageously being well below the floor level.

Figs. 11 to 13 show, in profile, the three horizontal and substantially transverse axes of rotation of the central portion 102 of the seats, namely 103 at the head end, 104 at the bottom of the reclining profile, and 105 at the foot end, with a twin sliding link of the tubes 106 in their sleeves 107. The balls 108 pressed by the spring 109 wedge automatically against the cone 110 and lock the compensation spring 111 under the weight of the body. The balls 108 can be unjammed using the pull cord 112, with a lever 113 in reach of the hand, or of the foot, actuating the part

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114 via the opposing spring 115, provided the body curls slightly, and therefore only when the occupant so wishes.

Fig. 14 depicts, in a railway carriage of the transverse type with a single lateral corridor 34, a central transverse passage 116 opening to two additional sliding access doors 117, 118, with their housings 119, 120. This reduces the mean interior path between access doors 117, 67 or 118, 68 and seats almost by half. This passage 116, with at least the same number of seats, is obtained by the aforementioned saving that is due to the ladders 84, and through the reduction of the platforms 65, because traffic is partly diverted through the new doors 117 or 118.

The angled outlines of the two half modules 121, 122 can be covered and supplemented with equipment cupboards, not drawn.

With an odd number of compartments, the said passage 116 can be inserted between two half compartments 37' each closed by a lateral wall and lateral door, these again being cylindrical, and not drawn, including the ladder.

Fig. 15, as an alternative form of Figs. 2 to 6, depicts, at each end of the modules, a vertical support structure made up in halves of two cylindrical walls 123, 124 and 125, 126, therefore already rigid per se as a result of this, but further strengthened locally, particularly by portions of triangular vertical section pieces, alternating from one stage 127, 128 to the other 129, 130, which do not impinge on the volumes actually used, as they are each located in a dead space.

It is also notable that these cylindrical walls 123, 124 and 125, 126 practically maintain the volume of the living space because their vertical axes are at the intersections 131 or 132 of the vertical planes of symmetry of the central portions 5, 6 which are common to the various levels.

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The compartments are equipped with cylindrical sliding doors which are coaxial in the closed position 133, 134 or open position 135, 136.

The result of this is a further saving on used
5 space. Already the stiffened simple walls 51, 52 and
55, 56 replacing conventional partitions 2 cm thick
have allowed a saving of almost 4 cm in the width of
the carriage. In addition, replacing the flat walls 51,
52, 55, 56 with cylindrical walls 123, 124, 125, 126
10 which do not make the living space smaller at the end
of the compartments 37, on the one hand, gives an
almost 2 cm increase in the thickness used for luggage
storage spaces 47, 48 thanks to their wider access
openings 137, 138 and, alongside the lateral corridor
15 34, on the other hand, gives a gain of about 3 cm in
the width of the carriage, by dispensing with the 4 cm
section piece 25 and replacing the thick flat doors 27,
28 with slim cylindrical doors 135, 136.

Furthermore, the rounded shape of these doors
20 means that when the doors are closed 133, 134 the
corridor 34 becomes wider at this point 139, which
occurs repeatedly at short intervals, making passing
easier.

Note that with the central doors 117, 118, the
25 lower framework of the carriage narrows at the lateral
discontinuities thus created, in order to respect the
continuity of the longitudinal structure.

Note too that the lowermost profile of the
articulated central portion 102 corresponds to those of
30 Fig. 3. Nobody can therefore disturb his neighbour,
variations occurring within one's own volume.

Finally, to top the feeling of high overall
comfort, it will be noted that the aesthetics of each
device is always combined with its function as
35 described in the foregoing description, namely the
elongate seats themselves which are double head to toe,
the support plates, the cylindrical doors and walls of
the compartments, the articulated reclining profile
that gives a more or less couched position, the

- 10 -

articulated ladder whose use at an incline is easier and is easier to get past, the cylindrical walls and doors of the four washrooms, the fifth level and the central passage which reduces the path inside with hand
5 luggage almost by half.

There are two details to be noted. Firstly, the elongate seats with a reclining profile and a width that decreases towards the foot end, double head to toe, reduce the individual volume by half for the same
10 level of bodily comforts: 0.75 high with four stages instead of three, 0.75 wide with $60 + 30 = 90$ cm instead of $60 + 60 = 120$ cm, and 0.91 long with 184 cm for a developed size of 202 cm. Now, $0.75 \times 0.75 \times 0.91 = 0.51$.

Secondly, the cylindrical wall of the washrooms focuses and superposes the three functional areas S1, S2, S3 used respectively for entering/exiting, using the toilet and using the basin, thus dispensing with (S2 + S3) with each of the three aforementioned
15 successive functions retaining their level of comfort.
20

The foregoing description confirms the extent to which all the component parts of the vehicle, apparently disparate, do actually collaborate closely through their dimensions, their number and/or their
25 shapes, to yield this paradoxical important result, namely that of both improving the overall comfort offered to each traveller and increasing the number of travellers in the same unchanged volume.

[Translation of European Patent 0036822]

**New arrangement for fitting out transit areas and
vehicles**

A vehicle layout comprising at least one series of modules (2') each containing a set of elongate seats (3, 4) with a reclining or even couched profile, each occupying 100% of the length of the module, the width of which decreases towards the foot end, these seats, which are superposed on several levels and accessible from the side via a corridor (64) with a ladder (46), being arranged top to toe on each level and top to toe from one level to the other, characterized in that each seat is divided transversely into three portions, namely a main central portion (5, 6) representing about 70%, which, viewed in plan, is a symmetrical trapezium which is interchangeable in the finished state, inserted between two asymmetrical padded flat panels for the head and for the feet (7', 8') and (11', 12') respectively, these representing approximately 15% each and being interchangeable in the bare state.

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